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(54) Quilting machine with relatively moving cloth holder carriage and sewing head in mutually orthogonal directions.

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Description

This invention relates to a quilting machine with relatively moving cloth holder carriage and sewing head in mutually orthogonal directions.

Currently available, commercially, are various quilting machine types which are employed for quilt working mattresses, bedspreads, comforters, and the like articles. One type, such as disclosed in UK Patent No. 1,207,451, comprises a first carriage, on which a cloth to be quilted is held, arranged to run linearly on a second carriage. The latter carriage runs, also linearly, on an orthogonal plane to that of the first carriage.

Both carriages are driven to move under a stationary sewing head along a path determined by a template or other constraint.

Another type of a quilting machine, such as disclosed in French Patent No. 1,550,051, operates in precisely the opposite way, i.e. with the sewing head moving along orthogonal axes over a stationary carriage holding a cloth to be quilted. A further document FR—A—385 529 discloses a sewing machine comprising a cloth holding carriage, whereon a cloth is stretched in the horizontal area and is driven by said carriage back-and-forth along a rectilinear path. Said sewing machine is provided with a sewing head moving also back-and-forth in a direction orthogonal to the direction of travel of said carriage.

The first two of the types mentioned above can provide elaborate sewing. However, the carriage drive poses, on account of the inertia masses involved, somewhat narrow limits on operation, and the unavoidable shaking encountered adversely affects the quilting operation accuracy.

The quilting machine of the third type, alternatively, finds application for just repetitive quilting of the inferior class.

It is a primary object of this invention to provide a quilting machine which can obviate such prior shortcomings, in particular by significantly attenuating the vibratory affects on the cloth holder carriage, so as to afford high quality sewing in a shorter time.

A further object of this invention is to provide a quilting machine which is highly flexible in operation, in connection with its ability to perform elaborate seam lines.

These objects are achieved by a quilting machine as defined in claim 1.

Further features of the invention will be more readily understood from the detailed description which discloses an embodiment thereof, as illustrated by way of exmaple in the accompanying drawings, where:

Figure 1 is a front elevation view of a twin sewing head sewing machine according to the invention;

Figure 2 is a view taken on the plane II-II of Figure 1;

Figure 3 is a view taken on the plane III-III of Figure 1;

Figure 4 is a view taken on the plane IV-IV of Figure 2 and to an enlarged scale; and

Figure 5 is a view, also to an enlarged scale, of the carriage as shown in Figure 1.

With reference to the drawing views, generally indicated at 1 is an overhead frame comprising an upper horizontal beam 2 and lower horizontal beam 3 which are supported at the opposed ends thereof by two floorstanding pillars 4,5. The lower beam 3 is supported by a third piller 6 located intermediately between the pillars 4,5 but shifted toward the latter. The beams 2,3 have, when viewed in cross-section, the shape of two U's opening toward each other.

Between the beams 2,3 and pillars 4,5, there are defined two openings 7,8 of equal length the lower whereof is split in two by the intermediate pillar 6 to define an additional opening 9.

Attached to the inward faces of the pillars 4,6 are two brackets 10,11 which protrude from said pillars in horizointal alignment and to which two respective horizontal longitudinal stringers 12,13 are attached which extend parallel to each other and perpendicularly to the frame 1.

The longitudinal stringers 12,13 extend through the opening 8 to overhang on opposed sides of the frame 1. The ends of the longitudinal stringers 12,13 stand on the floor through substantially vertical adjustable height feet, 14 thereby enabling said longitudinal stringers to be supported on a truly horizontal plane. The longitudinal stringers have spacers 15 attached thereto to which are in turn attached two cylindrical bars 16,17 which serve as runways for a carriage 18 whereon a cloth to be quilted should be stretched.

The carriage 18 comprises a rectangular frame formed by lengthwise 19 and crosswise 20 sectional members, having at its corners four idle wheels 21 which are grooved circumferentially and enable the carriage 18 to travel along the bars 16,17.

The crossmembers 20 have the horizontal portions of two pairs of right-angled elements 22,23 attached thereto.

Rigidly connected to the vertical portions of said two pairs of right-angled elements 22,23 are two pairs of plates 24 and 25 which support two parallel shafts 26,27 through bearings.

The shaft 26 is driven rotatively via a center reduction gear 28 which receives its motion from a motor 29 through a drive belt 30 and respective pulleys 28a,29a keyed on the output shafts of the reduction gear and motor. The motor 29 and reduction gear 28 are mounted on a box-like bracket 31 attached to the crossmember 20.

Keyed on the shafts 26,27, at the opposed ends thereof, are respective pairs of output 32 and input 33 sprocket wheels which are in mesh engagement with two chains 34,35 trained thereabout in closed loop configuration and being deflected by deflector wheels 36,37 to present two proximate, horizontal runs. Such horizontal runs are enclosed by shrouds 38,39 the end portions whereof are bent arcuately upwards above the sprocket wheels 32.

The links of the chains 34,35 comprise juxtaposed arms 40,41 (see Figure 5) which project in

opposed directions and carry blocks 42,43 bristling with outwardly facing needles 44,45. Keyed on the shaft 26, adjacently to, and rotating concurrently with, the blocks 42,43, are disks 46,47 the outer diameter whereof is larger than that defined by the ends of the needles.

The needles have the purpose of holding the cloth to be quilted along the longitudinal edges. Penetration of the needles into the cloth is achieved by means of a pair of circular brushes 48 carried rotatably in arms 49 articulated to the ends of extensions 50 of the pair of right-angled elements 23.

The brushes 48 are coplanar with the needles 44,45 and held against the latter by pneumatic jacks 51 interposed between the tops of said pair of right-angled elements 23 and oscillating arms 49. The cloth which should be stretched between the needles 44,45 is picked up by a roll 52 supported on a frame 53 which is attached to the carriage 18 through a hinge 54. The frame 53 has two feet 55 comprising rotatable wheels 56 which run on a pair of rails 57 secured on the surface and parallel with the rails 16,17.

The motion of the carriage 18 is derived from a gear motor 58 suspended, through brackets 59, from the lower beam 3 of the frame 1. The gear motor 58 drives a shaft 60 which is supported, at its opposed ends, on shoulders 61,62 projecting downwards from the beam 3.

Keyed to the ends of the shaft 60 projecting beyond the shoulders 61,62 are pinion gears 63,64. On each shoulder 61,62 are cantilevered a pair of idle gear wheels 65,66 lying on the same plane as the pinions 63,64 but on opposite sides with respect to the latter.

The pairs of gear wheels 65,66 keep trained at a certain angle around the pinion gears 63,64 two chains 67 stretched between the first and rear crossmembers 20 of the carriage 18 to form two racks which are in mesh engagement with said pinion gears 63,64.

As illustrated in Figure 3, the chains 34,35 are passed through the opening 7 as the carriage frame moves through the opening 8, thereby the beam 3 is located under the chains 34,35 and over the longitudinal stringers 19.

Inside the beams 2,3, and extending over the full length of the latter, are two pairs of guide bars 68,69 supporting the sewing head carriage 70.

The bars 68,69 have a square cross-section and are positioned edgewise on the sidewalls of the beams 2,3 by means of diagonal elements 71,72 whereto they are attached.

The carriage 70 comprises two planeparallel plates 73,74 identical to each other and shaped like a "C" with two horizontal portions 75,76 which extend into the beams 2,3 and are connected through vertical portions 77 (see Figure 4).

The plates 73,74 are interconnected by partitions interposed between the upper portions 75 and partitions 79 interposed between the lower portions 76. Attached to the outer faces of the plates 73,74 are pairs of small blocks 81,82,83 and 84, of which the first pair are rigid with the upper portions 75 and the second pair with the lower portions 76. Cantilevered from each block 81—84 are a pair of small rollers 85 having their rotation axes arranged at 90° to each other and in tangential rolling engagement with the juxtaposed faces of the bars 68,69. Mounted between the vertical portions 77 of the carriage 70 is a bracket 86 which projects from the vertical portions 77 in the opposite direction to the horizontal portions 76.

On the bracket 86, which is strengthened by underlying ribs 87, there is mounted an electric motor 88 with a shaft whereto the drive pulley 89 is keyed. Trained around the pulley 89 is a belt 90, which is also trained around the driven pulley 91.

The pulley 91 is keyed to a shaft 92 which is journaled within, and carried rotatably in between two partitions 78 and extending on the centerplane of the carriage between the upper portions 75 over nearly the full length of the latter. Keyed to the shaft 92, beside the pulley 91, is a positive drive sprocket wheel 93 which, through a toothed belt 94, transmits the motion to a second sprocket wheel 95 rotatively keyed to a shaft 96 journalled at the partitions 79. The shaft 96 is parallel to the upper shaft 92 and extends between the horizontal lower portions 76, of the carriage 70.

Fastened between the upper portions 75 is a plate 97 having slots 98 extending parallel to the shaft 92.

Suspended from the plate 97, by means of brackets 99,100 is a sewing head 101 of conventional design, which receives its motion from the shaft 92 through a drive including two sprocket wheels 102,103 and a corresponding toothed belt 104. The pulley 102 is rotatively rigid with a splined portion 105 of the shaft 92 and has a circumferentially grooved side bushing 106, with which there engages a yoke 107 presented at the top of the bracket 100. Thus, on loosening the fastening bolts of the brackets 99,100 from the plate 97 it becomes possible to shift the sewing head along the plate itself and the pulley 102 along the splined portion 105. Likewise, between the ends of the upper portions 75, there are arranged two plates 108 from which a second sewing head 111 is suspended through brackets 109,110, stationary relatively to the carriage 70. This sewing head also receives its motion from the shaft 92 through a drive including two sprocket wheels 112,113 and a corresponding toothed belt 114.

Cooperating with each of the sewing heads 101,111 are respective "hook" devices 115,116 mounted on respective plates 117,118 interposed between the carriage lower portions 76.

The hook device 115 can be shifted across the plate 117 to proceed the displacement of the sewing head, whereas the device 116 is stationary. The device 115 receives its motion from the shaft 96 via a belt drive 119 which is trained around a pulley 120 keyed to the shaft 96 and a pulley 121 keyed to a shaft suitably journaled within the hook device 115. The device 116 is juxtaposed to the device 115, in order to extend

the lateral bounds of the sewing machine working range and improve access to the cops thereby facilitating their replacement. To obtain the same direction of rotation for the hook, however, a reversing gear is provided which comprises two gear wheels 122,123 accommodated in the device and meshing together, of which the wheel 122 drives the hook and the other wheel 123 is secured on the axle carrying the pulley 124 which receives its motion from the shaft 96 through the belt 125 and pulley 126. It should be noted that the shaft 96 is divided into two sections which may be coupled together by means of an axially sliding splined bushing 127. The bushing 127 is in constant rotary engagement with the end of one section and can overlap the end of the adjacent section to rotatively engage the latter on operation of a yoke lever 128 journalled between the portions 76. Thus, it becomes possible to isolate the end section 129 of the shaft 96 from the drive means 88—95 when the second sewing head 111 is not to be operated (see Figure 4).

The movement of the carriage 70 along the guides 68,69 is generated by a gear motor 130 having a sprocket wheel 131 around which a chain 132 is trained. The lower run of the chain 132 extends below the beam 3 through openings in the pillars 44 and 6 and is passed around a sprocket wheel 133 journalled axially in a support 134 attached to the outside of the pillar 4. The upper run of the chain 132 extends into the beam 3 and is deflected away from the axis of said sprocket wheel 131 by an idle roller 135, thereby defining a horizontal trajectory, parallel to said lower run. One point on the chain upper run is secured to the carriage 70 by means of a small plate 136 (Figure 2).

The quilting machine described hereinabove operates as follows. First, the cloth is positioned on the carriage 18. To accomplish this, the cloth is unwound from the roll 52 and deflected horizontally by a roller 137 on the frame 53 (Figure 3) under the brushes 48 which drive its edges onto the needles 44,45. The driving of the chains 34,35 generated by means of the motor 29 causes the desired length of cloth to be fed a corresponding distance under the sewing heads and over the respective hook devices.

Then, the sewing step begins with the actuation of the motor 88 which powers the sewing heads 101,111 and hook devices 115,116.

Simultaneously the motors 58 and 130 are operated to move the cloth holding carriage 18 along the rails 16,17, and respectively, the carriage 70 along the bars 68,69. The orthogonal reciprocating movements of the carriages 18 and 70 enable the effectuation of any seam lines and, hence, of an indefinite range of patterns.

The carriage drive motors are suitably controlled by a microprocessor or the like electronic processor. It is possible, however, to perform the quilting operations by controlling the carriages through a traner point arranged to follow a template.

On completion of the quilting operations, a fresh cloth section paid out from the roll 52 can be stretched between the chains 34,35, whilst the completed quilted cloth section is simultaneously ejected from the carriage 18. Disengagement of the needles 44,45 is accomplished by the disks 46,47 which, having a larger diameter, than that defined by the ends of said needles, will raise the cloth edges off the needles as the cloth is on the point of leaving the carriage. The machine may be equipped with a cutter device to sever the completed quilted cloth section from the remaining cloth.

It may be appreciated that the invention fully achieves its objects. In particular, it is to be noted that the cloth to be quilted is only allowed to move in one direction, thus greatly reducing the margin for errors due to the carriage being stopped and restarted.

An additional advantage is that the moving masses are reduced to permit higher speed operation.

Specially advantageous has proved to be the use of several sewing heads placed at adjustable mutual spacings to optimize performance and, simultaneously achieve highly versatile operation features regarding cloth size and effectuation of complex pattern seam lines.

The invention as disclosed is susceptible to many modifications and changes. One of these envisages, for instance, that a frame be used instead of the chains 34,35 whereon the cloth would be stretched and held down by suitable clamps. Another modification provides for the roll of cloth to be either supported directly on the carriage or held stationary on the floor. The quantity of rolls may vary according to the number of layers composed within the manufactured article.

Claims

1. A quilting machine, comprising a cloth holding carriage (18) whereon a cloth to be quilted is stretched on a horizontal plane and which is movable along a rectilinear path, there being arranged above said cloth at least one sewing head (101) guided in an orthogonal direction to the carriage travel direction, and a means (58—67; 130—136) being provided for driving said carriage (18) along runways (16, 17) to cause the seam line to follow a preset pattern, said sewing head (101) being mounted on a second carriage (70) running along horizontal beams (2, 3) overlying said first carriage (18) in an orthogonal direction to that of the latter, characterized in that said second carriage (70) comprises two planeparallel plates (73, 74) interconnected by partitions (78, 79) and having a C-like shape with two horizontal portions (75, 76) which extend respectively over and under the cloth to be quilted and that stationary guide beams (68, 69) for said horizontal portions (75, 76) above and beneath said cloth are provided.

2. A quilting machine according to claim 1 characterized in that two shafts (92, 96) are pro-

vided extending between said horizontal portions (75, 76), said shafts driving said sewing head (101) and a hook device (115) mounted on said carriage (70).

3. A quilting machine according to claim 2 characterized in that a motor (130) is provided for driving said two shafts.

4. A quilting machine according to claim 3, characterized in that the hook device (116) cooperating with the stationary sewing head (111) is driven by a section of its respective drive shaft (96) rotatively coupleable to the remaining shaft portion by means of an axially sliding splined bushing (127).

5. A quilting machine according to any of Claims 1—4, characterized in that it comprises a closed loop chain (132) on the plane defined by the reciprocating movement of said second carriage (70), having a section which extends parallel to said plane defined by the reciprocating movement of said second carriage (70) and being attached to a point (136) thereon, said chain (132) being adapted to be driven in either direction by a gear motor (130).

6. A quilting machine according to Claim 1, characterized in that the cloth holding carriage (18) is provided with chains (67) stretched in the direction of movement of said cloth holding carriage and acting as a rack for engagement by a pinion (64) of a reversible gear motor (58) for driving said cloth holding carriage in either direction.

7. A quilting machine according to Claim 1, characterized in that for supporting the cloth a pair of closed-loop powered chains (34,35) are provided on said cloth holding carriage having two parallel runs, said chains including links wherewith holding arms (40,41) are made rigid with blocks (42,43) supporting a plurality of needles (44,45) pointing upwards and acting as members adapted to engage the side edges of the cloth to be quilted.

8. A quilting machine according to Claim 7, characterized in that the cloth is pulled out of a roll (52) supported on a moving frame (53) said frame being provided with rails (57) and towed by the carriage (18).

9. A quilting machine according to Claim 8, characterized in that it comprises a pair of rotating brushes (48) coplanar with the needles (44,45) and adapted to drive the cloth edges onto the latter.

Patentansprüche

1. Steppmaschine, bestehend aus einem Stoffhalteschlitten (18), auf dem ein zu steppender Stoff auf einer horizontalen Ebene aufgespannt wird und der entlang einer geraden Bahn bewegbar ist, wobei oberhalb des Stoffes wenigstens ein in einer senkrechten Richtung zur Bewegungsrichtung des Schlittens geführter Nähmaschinenoberteil (101) angeordnet ist und eine Einrichtung (58—67; 130—136) vorgesehen ist, um den Schlitten (18) entlang Laufbahnen (16, 17) zu bewegen und die Nahtlinie zu veranlassen, einem vorbestimmten Muster zu folgen, welcher Nähmaschinenoberteil (101) auf einem zweiten Schlitten (70) montiert ist, der auf horizontalen Trägern (2, 3) läuft, die oberhalb des ersten Schlittens (18) in einer Richtung liegen, die senkrecht zu der des letzteren verläuft, dadurch gekennzeichnet, daß der zweite Schlitten (70) aus zwei planparallelen Platten (73, 74) besteht, die untereinander durch Querwände (78, 79) verbunden sind und eine C-Form mit zwei horizontalen Abschnitten (75, 76) besitzen, welche sich über bzw. unter des zu steppenden Stoff erstrecken, und daß stationäre Führungsträger (68, 69) für die genannten horizontalen Abschnitte (75, 76) oberhalb und unterhalb des Stoffes vorgesehen sind.

2. Steppmaschine nach Anspruch 1 dadurch gekennzeichnet, daß zwei Wellen (92, 96) vorgesehen sind, die sich zwischen den genannten horizontalen Abschnitten (75, 76) erstrecken und die Nähmaschinenoberteile (101) und eine auf dem Schlitten (70) angeordnete Greifervorrichtung (115) antreiben.

3. Steppmaschine nach Anspruch 2, dadurch gekennzeichnet, daß ein Motor (130) zum Antrieb der zwei Wellen vorgesehen ist.

4. Steppmaschine nach Anspruch 3, dadurch gekennzeichnet, daß die mit dem stationären Nähmaschinenoberteil (111) zusammenwirkende Greifvorrichtung (116) durch einen Abschnitt ihrer jeweiligen Antriebswelle (96) angetrieben wird, der an den übrigen Wellenteil mittels einer axial verschiebbar, kerbverzahnten Hülse ankuppelbar ist.

5. Steppmaschine nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß sie auf der durch die Hin- und Herbewegung des zweiten Schlittens (70) definierten Ebene eine schleifenförmige Kette (132) aufweist, die ein Trum besitzt, welches sich parallel zu der durch die Hin- und Herbewegung des zweiten Schlittens (70) definierten Ebene erstreckt und an einer Stelle (136) an diesem befestigt ist, wobei die Kette (132) durch einen Getriebsmotor (130) in beiden Richtungen antreibbar ist.

6. Steppmaschine nach Anspruch 1, dadurch gekennzeichnet, daß der Stoffhalteschlitten (18) mit sich in Richtung der Bewegung dieses Stoffhalteschlittens erstreckenden Ketten (67) versehen ist, die als Zahnstange zum Eingriff mit einem Ritzel (64) eines umschaltbaren Getriebemotors (58) für den Antrieb des Stoffhalteschlittens in beiden Richtungen wirken.

7. Steppmaschine nach Anspruch 1, dadurch gekennzeichnet, daß zur Halterung des Stoffes auf dem Stoffhalteschlitten ein Paar von schlaufenförmig in sich geschlossene Ketten (34, 35) mit zwei parallelen Trumen vorgesehen sind, welche Ketten Zwischenglieder aufweisen, mit denen Haltearme (40, 41) starr mit Blockteilen (42, 43) verbunden sind, die eine Vielzahl von nach oben weisenden Nadeln (44, 45) halten und als Glieder zum Eingriff mit den seitlichen Rändern des zu steppenden Stoffes wirken.

8. Steppmaschine nach Anspruch 7, dadurch

gekennzeichnet, daß der Stoff von einer Walze (52) abgezogen wird, die auf einem beweglichen Rahmen (53) gehaltert ist, der mit Schienen (57) versehen ist und vom Schlitten (18) gezogen wird.

9. Steppmaschine nach Anspruch 8, dadurch gekennzeichnet, daß sie ein Paar rotierender, mit den Nadeln (44, 45) komplanarer Bürsten (48) aufweist, welche die Stoffränder auf den ersteren mitnehmen.

Revendications

1. Machine à matelasser comprenant un chariot porte-tissu (18) sur lequel le tissu est tendu dans un plan horizontal et qui est déplaçable suivant un trajet, au moins une tête de machine à coudre placée au-dessus du tissu pour être guidée dans une direction orthogonale par rapport à celle du chariot, des moyens (58—67; 130—136) destinés à déplacer ledit chariot (18) sur des rails (16—17) afin que la couture suive un modèle prédéterminé, tandis que la tête de machine à coudre (101) est montée sur un second chariot (70) se déplaçant le long de profiles (2, 3) situés au dessus du premier chariot (18), dans une direction orthogonale par rapport à celle de ce dernier, caractérisé en ce que le second chariot (70) qui est composé de deux plaques planes parallèles (73—74) réunies par des cloisons (73—79), affecte la forme d'un C avec deux parties horizontales (75, 76) s'étendant respectivement au dessus et au dessous du tissu à matelasser, des guidages (68, 69) des parties horizontales (75, 76) étant prévus au dessus et en dessous du tissu.

2. Machine à matelasser suivant la revendication 1, caractérisée en ce qu'on a prévu deux arbres (92, 96) disposés entre les parties horizontales (75, 76) pour guider la tête de machine à coudre (101) et un dispositif à crochet (115) monté sur ledit chariot (70).

3. Machine à matelasser suivant la revendication 2, caractérisée en ce qu'un moteur (130) commande les deux arbres.

4. Machine à matelasser suivant la revendication 3, caractérisée en ce que le dispositif à crochet (116) coopérant avec la tête de machine à coudre (111) est entraîné par une partie de son arbre de commande (96) accouplée au reste de cet arbre au moyen d'un manchon coulissant (127).

5. Machine à matelasser suivant l'une quelconque des revendications 1 à 4, caractérisée en ce qu'elle comprend une chaîne sans fin (132) disposée dans le plan défini par le mouvement et va et vient dudit second chariot (70), attachée à un point (136) de celui-ci et entraînée dans les deux sens par un moto-réducteur (130).

6. Machine à matelasser suivant la revendication 1, caractérisée en ce que le chariot porte-tissu (18) comporte des chaînes (67) entraînées dans le sens du déplaçement dudit chariot porte-tissu et agissant comme une crémaillère en engrenant avec un pinion (64) d'un moto-réducteur réversible (58) en vue de déplacer ledit chariot dans les deux directions.

7. Machine à matelasser suivant la revendication 1, caractérisée en ce que deux chaînes sans fin (34, 35) comportant des courses parallèles sont prévues sur le chariot porte-tissu pour supporter le tissu, lesdites chaînes étant pourvues de liaisons comportant des bras de maintien (40, 41) solidaires de blocs (42, 43) portant une pluralité d'aiguilles (44, 45) orientées vers le haut et propres à coopérer avec les lisières du tissu à matelasser.

8. Machine à matelasser suivant la revendication 7, caractérisée en ce que le tissu est tiré à partir d'un tambour (52) supporté par un châssis déplaçable (53) sur des rails (57) et associé au chariot (18).

9. Machine à matelasser suivant la revendication 8, caractérisée en ce qu'elle comprend deux brosses rotatives (48) situées dans le même plan que les aiguilles (44, 45) et propres à appliquer le tisssu sur ces dernières.

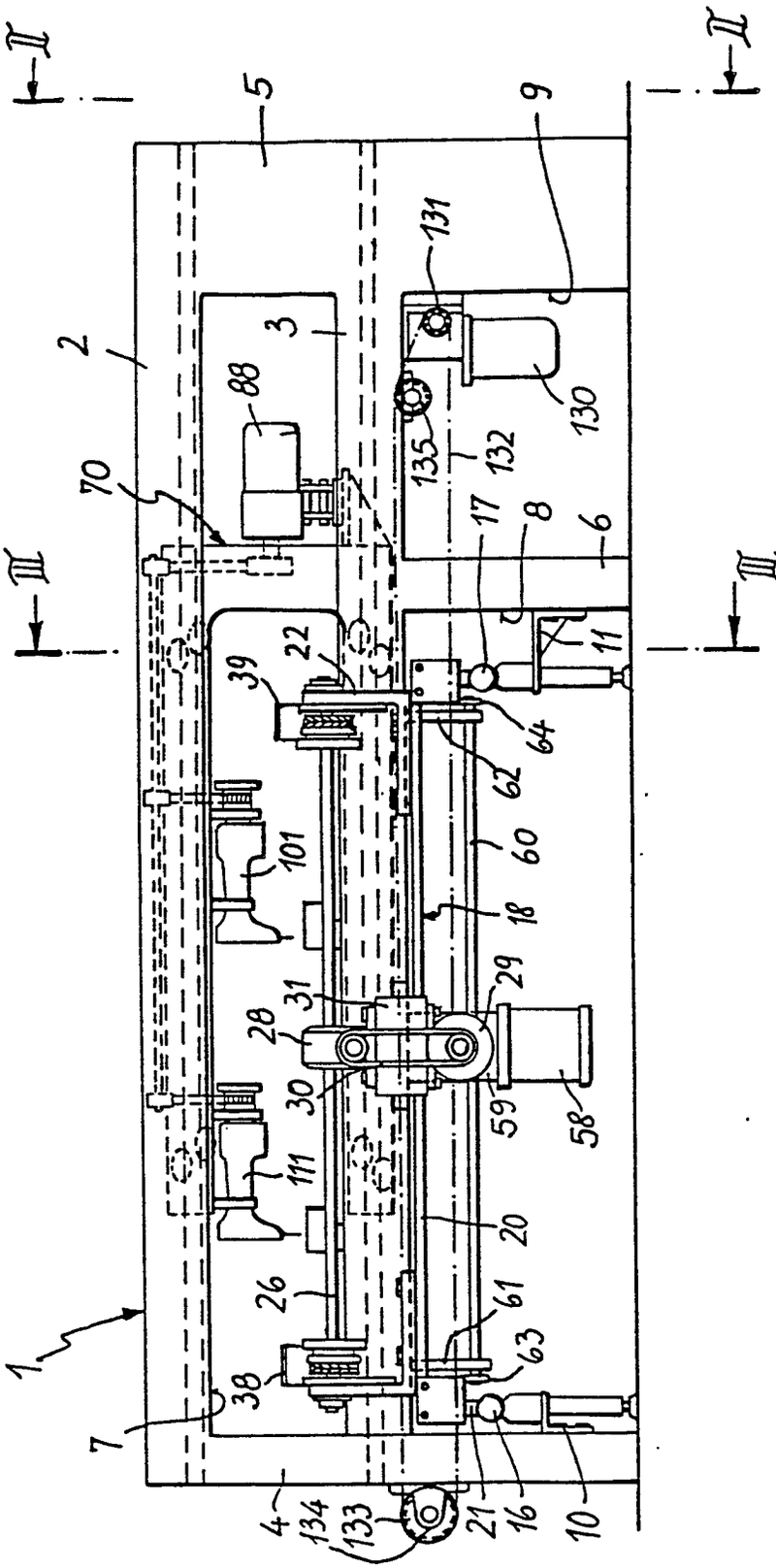
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Fig. 1

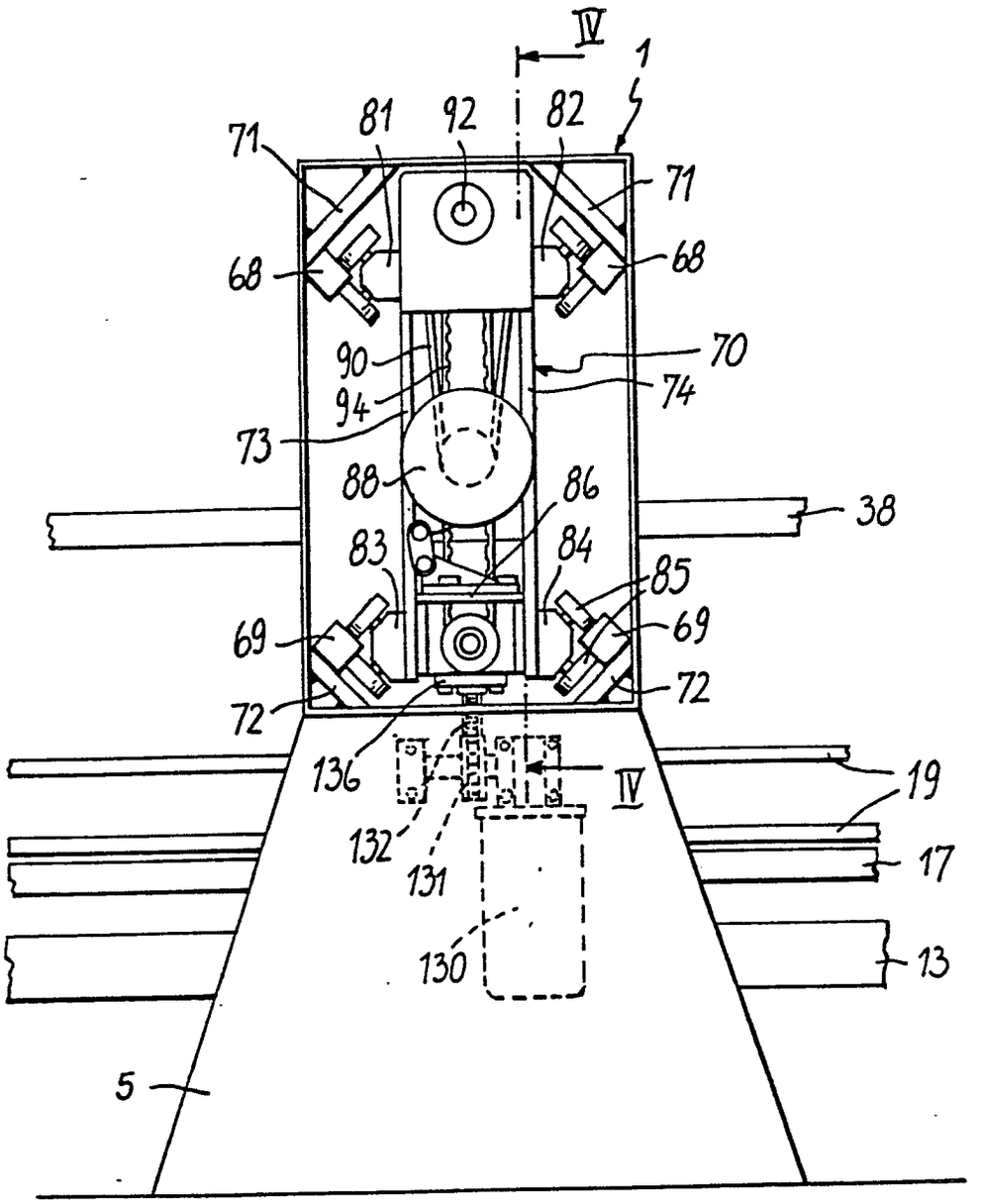
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Fig. 2

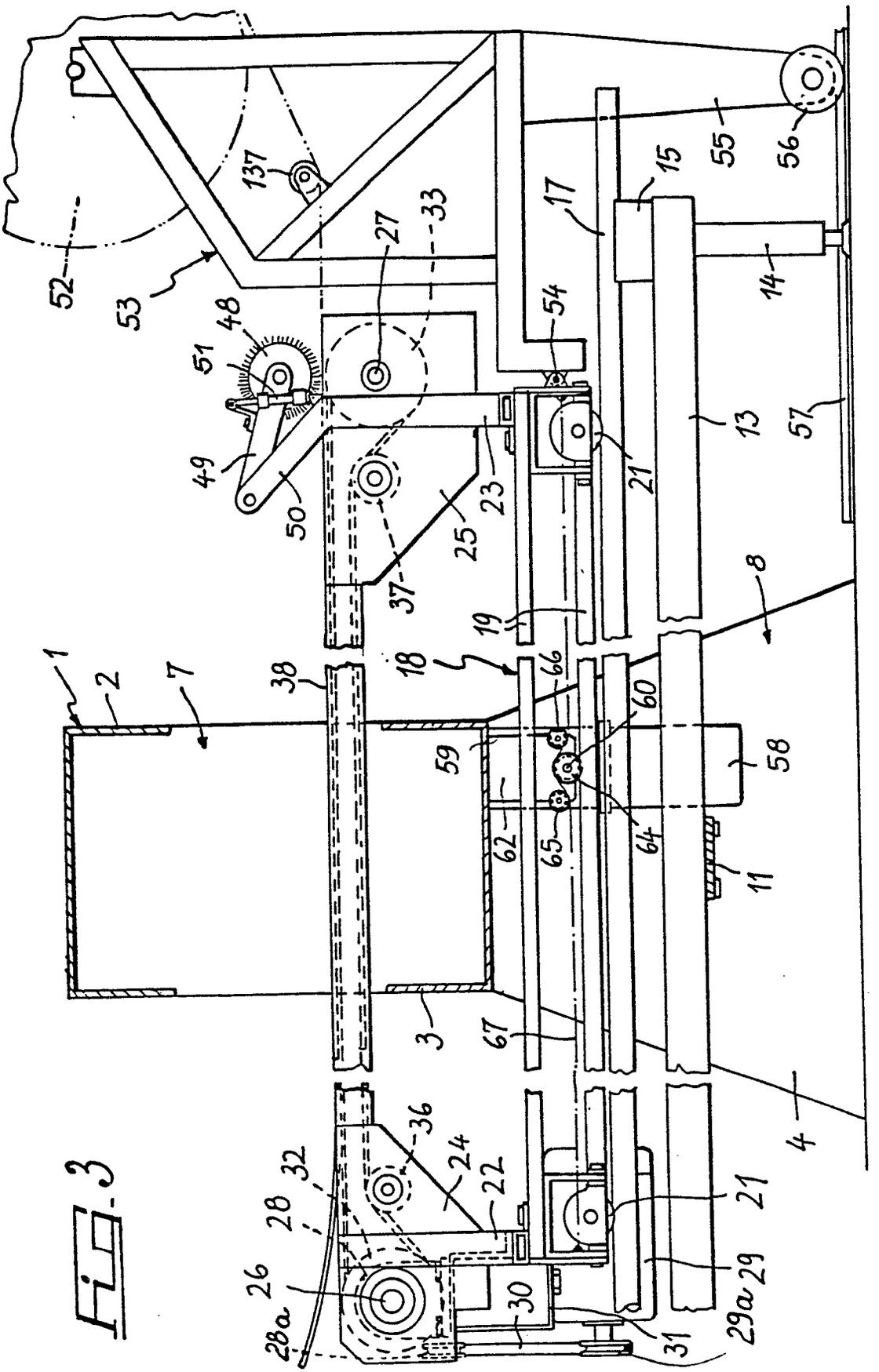
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Fig. 3

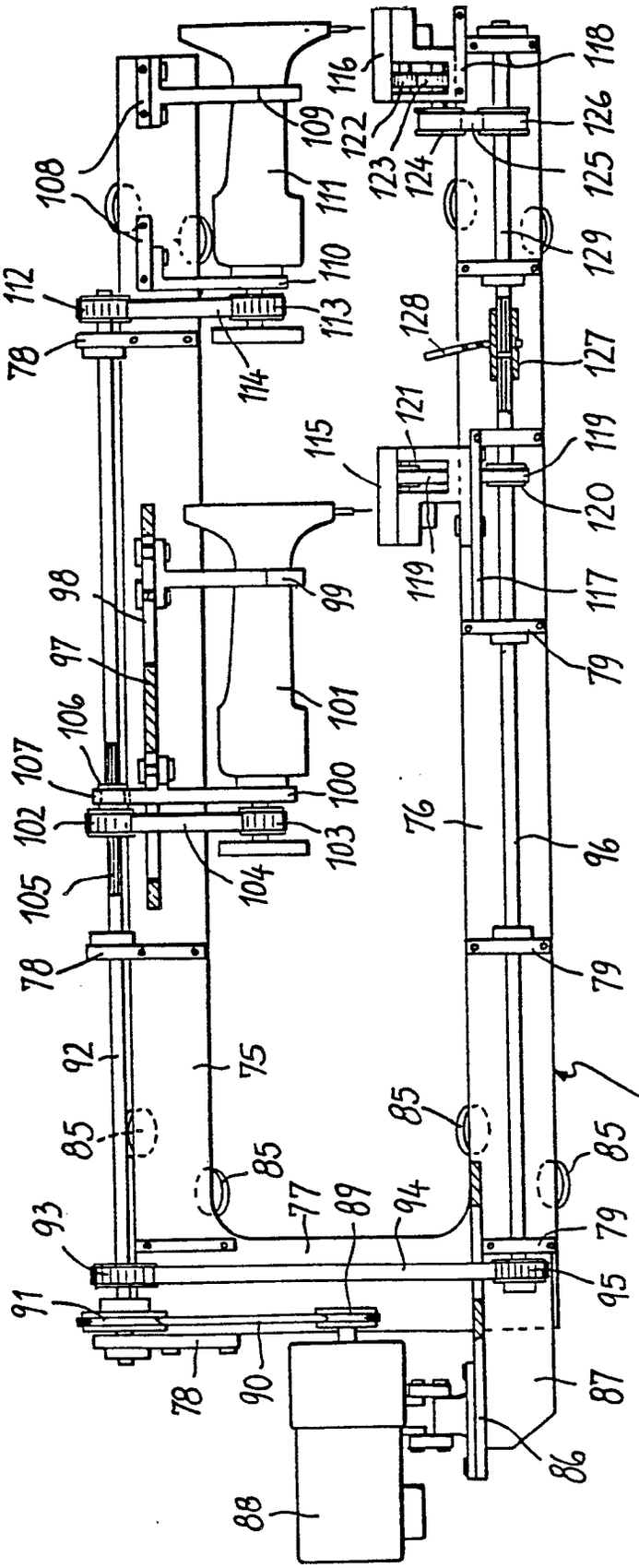
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Fig. 4

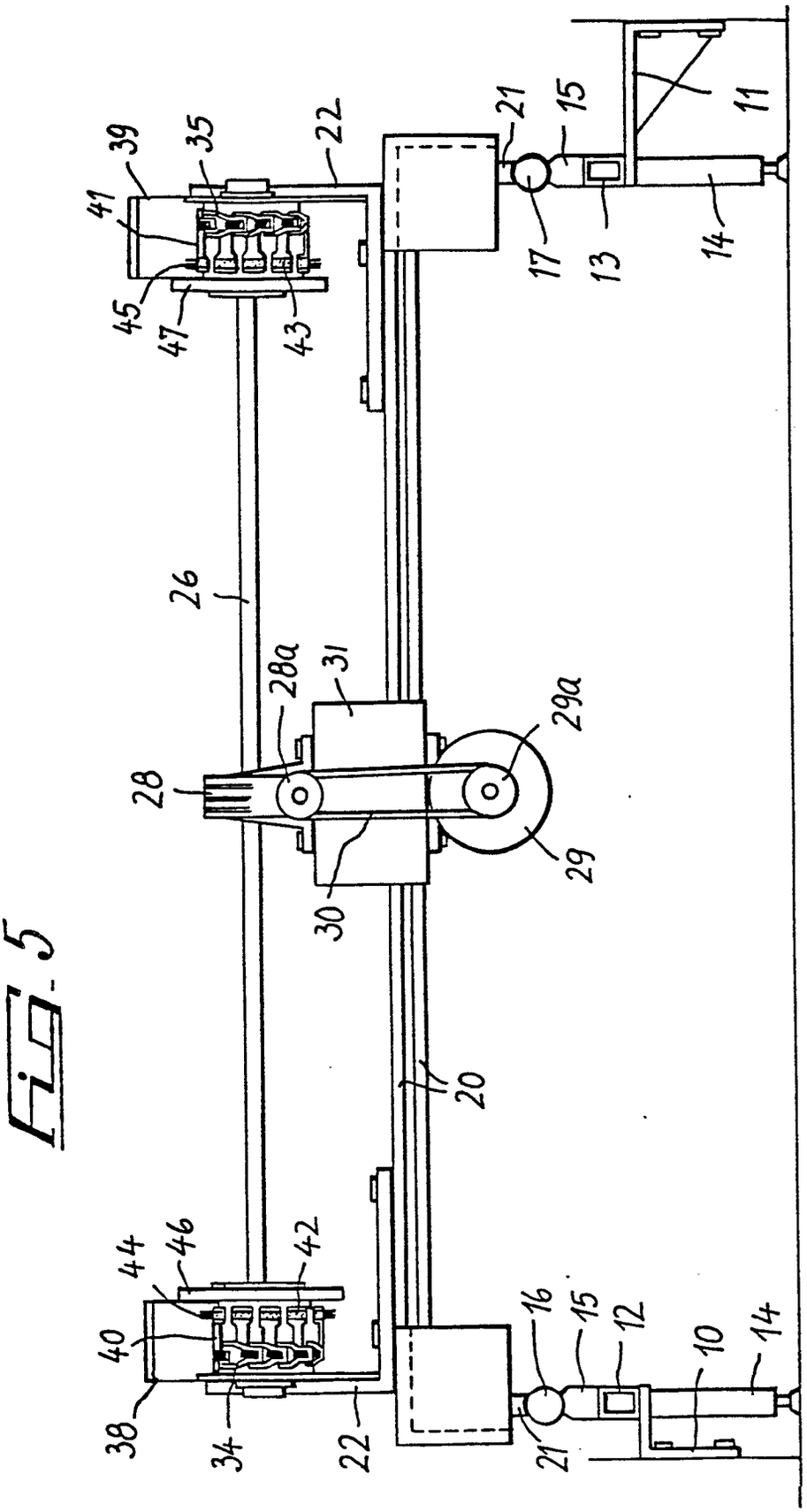
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Fig. 5